Innovative collaborative design in international interaction design summer schools

Book Section

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Chapter 11
Innovative Collaborative Design in International Interaction Design Summer Schools

Introduction

Fostering innovation in early design phases is a rarely discussed topic in research. Theories and studies into innovation usually schematize or classify design innovations considering for example successful products or processes of established businesses. However, there is little knowledge about the early and informal stages in the design process in other contexts leading to innovative design processes and products. Therefore, this article describes and analyses the collaborative design and learning process of three Interaction Design Summer Schools as examples of "early design phases". Interaction Design Summer schools teach interaction design principles through hands-on, user-centered design and learning experiences in an international setting. The analysis of the data supports the proposition that design innovation can be initiated in educational settings when special attention is paid to the context of learning and design. Hence, summer schools do not aim to produce a concrete innovative product, but offer a platform for acquiring knowledge and learning processes that support innovation through contextual, user-centered design.

Contextual learning and innovation are known concepts (Falk and Dierking's 2000, Ghosh and Chavan 2004). However, international design summer schools utilize user-centered and contextual design in combination with situated and collaborative learning in pioneering ways. Summer schools establish a context for learning and design innovation in a 2 week-program bringing together a heterogeneous group of participants from various cultural and professional backgrounds with the aim to accomplish a collaborative design project in and for the location where the summer school is held. There are no limitations to the scope of the design proposals despite the encouragement to interact with the local context as often and in diverse ways as possible. This inclusive setup and intense experience shapes the learning process and outcome of the participants. This article will show how cross-cultural and interdisciplinary teamwork as well as extensive fieldwork and frequent contact with the local population strongly influence the design proposals and innovations for new markets.

To the author's knowledge there is no research in the area of contextual and user-centered design innovation that explicitly addresses collaboration and facilitation practices of intercultural teams that seek to innovate for a local market. There is a need to look at the intercultural collaborative design and learning processes in much greater detail. This paper in particular explores how a local cultural context and a multi-cultural team composition influence the collaborative design and learning process. It summarizes the challenges and misunderstandings in the design process and proposes solutions to intercultural collaborative learning and design leading to innovative design ideas for products and services for a specific local market. In conclusion this paper will suggest a model and framework to support collaborative learning and design processes in international interaction design summer schools.

Background and Literature

User-Centered, Contextual Design Innovation

In the past decades researchers identified a variety of frameworks, systems and theories to identify modes and processes of innovation (Walsh 1996, Edquist 2001, Heskett 2005). Design innovation can be characterized as a process or product oriented activity. While process innovation refers to technological, organizational or methodological improvements, product innovation includes new or significantly improved ideas, goods and services (Edquist 2001). In the early years of research into design innovations, theories viewed innovation as being fueled by technological advances. However, while theories in this field advanced, user-centered innovation was reported to guide design innovation activities in business and

education (Dinçer 2003). Innovation by user-centered design was discussed on several accounts. (Chayutsahakij and Poggenpohl, 2002, Dinçer 2003, Mutlu and Er 2003) Questioning the definition of design innovation, Mutlu and Er (2003) suggest that design innovations contribute to the incremental improvement of the quality and usefulness of a product in order to suit the user needs better.

A growing body of research suggests that design innovation is a collaborative, user-centered and multidisciplinary process that relates to a specific locality. (Chayutsahakij and Poggenpohl 2002, Mutlu & Er 2003, Ghosh and Chavan 2004). The process and philosophy of user centered-design innovation is discussed by a variety of scholars (Chayutsahakij and Poggenpohl 2002, Rogers et al. 2002). They argue user centered design innovation largely depends on the context in and for which is designed. User-centered design usually begins by looking at the activities and interactions of humans in a certain situation. Observing an activity system, which consists of humans, a certain social setting and a related use of artifacts or technology, identifies design opportunities that might lead to innovative solutions.

Chayutsahakij and Poggenpohl (2002) presented results from expert interviews to determine which user-centered research and design methods are predominantly used in design innovation situations. Ghosh and Chavan (2004) stressed that collaboration and fieldwork are absolutely necessary in bringing up contextually relevant insights to innovate especially for new markets. They coined the term "contextual innovation" as a user-centered strategy and methodology in design and business innovation intended for local markets. Moreover, many researchers agree that learning and gaining new knowledge through experimental, user-centered and contextual experiences is a fundamental component of successful innovation practices (Ashton, 2001, Edquist 2001, Dinçer 2003). Hence, to explore the relation of design innovation, user centered-design and learning processes in more detail the next section will discuss various collaborative learning theories.

Situated, Collaborative Learning and Design

Team learning is seen as an important factor in design innovation processes (Ashton, 2001, Evers 2002, Zhang et al. 2002). However, for a long time, based on the dominant behaviorist approach in education, learning was viewed as a process of acquiring pre-structured knowledge, which was mediated from a more knowledgeable person (teacher) to the learners. In the 70's and 80's education research found that collaborative learning increases the learners' enthusiasm and confidence, which promotes the maturity of learning-supportive social skills in a specific situation inspiring creative thinking and leading to the creation of novel knowledge. (Piaget 1973). The idea of collaborative learning was pioneered by Piaget (1973) and named the constructivist approach to learning. This theory maintains that knowledge is socially constructed and learning a social process, based on problem solving in the real world. The constructivist approach informed the generation of a variety of theories of collaborative learning through social interaction (Wenger 1998). In an interview, Judee Hamburg stressed the connection between a specific context, learning, creativity and innovation. She argued that user-centered learning is about making people more creative, intelligent and innovative. (Conner 2004)

Similar to contextual and collaborative learning, constructivist theories influenced the advancement of contextual and collaborative design. (Lewin 1973) Following this line of thought, Interaction Design places a premier interest on involving a multiplicity of stakeholders and participants in the collaborative process. A variety of models of the design process were proposed in literature. (Rogers et al. 2002, Westerlund, 2005) Generally interaction design processes focus on a specific context and the user within this environment.

Based on above-mentioned contextual and user-centered traditions in learning and design, it is not unusual that the setup and implementation of an interaction design summer schools includes collaborative design and learning practices. User-centered design and situated learning practices are connected to an immediate context in which knowledge is gained and applied. In a contextual model of collaborative learning Falk and Dierking (2000) itemize that: learning begins with the individual, learning involves others and learning takes place somewhere. Hence, educators stress that it is important for contextual learning to incorporate as

many different forms of experience as possible (social, cultural, physical, and psychological) in working towards the desired learning outcomes.

Applying Falk and Dierking's (2000) contextual learning framework to the interactions in international design summer school suggests that being embedded in a team of culturally diverse members and a foreign cultural context offers rich experiences and enhances learning but might also add additional challenges to the learning and design process of the participants. The individuals are drawn from varying, culturally influenced approaches towards knowledge acquisition. Learning takes place through intercultural teamwork interacting with co-participants, whose learning and design attitudes, expectations and motivations are not necessarily shared. Hence interaction and production of a shared understanding is more difficult and time demanding. Last but not least, the summer school participants interact in a very different cultural and physical context, which requires the learners to accomplish a common design project for this local market. Participants need to learn to utilize the benefits and overcome the challenges of cross-cultural collaborative learning and contextual design in these early phases of design innovation.

Cross-Cultural Communication and Collaboration

As outlined in the previous section, knowledge is gained interactively in collaborative learning and design. However, research into cross-cultural communication reports that differences in the interaction styles across cultures have an enormous impact on intercultural learning and teamwork. (Bonk and King 1998, Gudykunst, 2004, Oritz 2000, Ostwald, 1995, Scollon and Scollon, 2001)

Differences in the interaction and learning styles among culturally diverse people can be described and explained using cultural value dimensions motioned in cross-cultural communication literature (Marcus & Baumgartner 2004). It has been stressed in literature that knowing about the differences in communication and interaction across cultures is necessary to successfully deal with possible breakdowns. Moreover, in order to sufficiently facilitate cross-cultural communication and collaboration researchers identified that building up a base of shared knowledge helps to overcome misunderstandings in intercultural interactions. (Bonk and King 1998, Ostwald 1995, Scollon and Scollon, 2001) Therefore, many researchers have taken an interest in differing communication strategies and how to overcome misunderstandings in intercultural communication. A variety of collaboration support frameworks (Ostwald 1995, Rogers et.al 2002) refer to the areas of awareness, communication, coordination and content in collaboration as issues that need special attention, support and facilitation in order to build common ground and deal with breakdowns. Drawing on the resources mentioned, Figure 1 synthesizes and expands on these concepts.

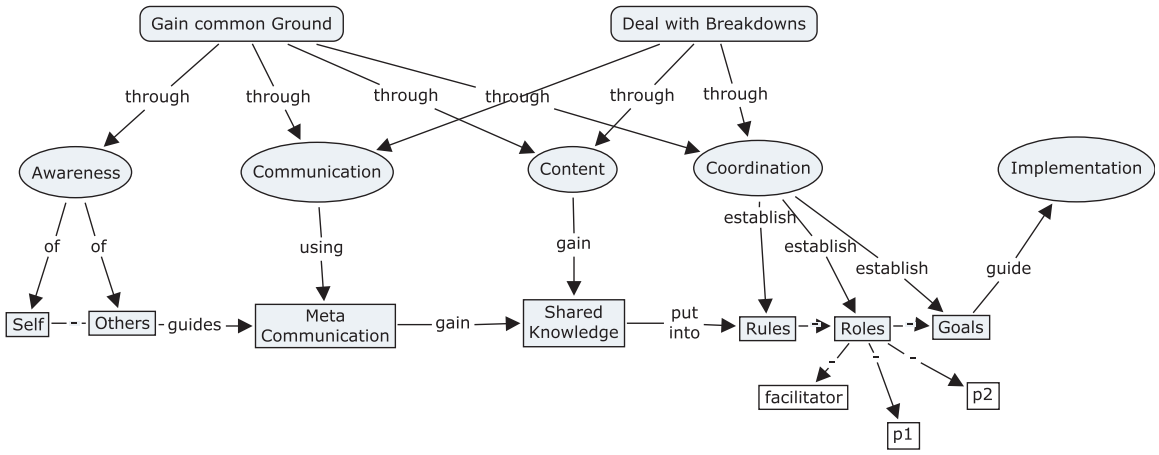

Figure 1. A Composite model to address breakdowns and gain common ground in the intercultural collaboration process

The model suggests that breakdowns can be addressed and shared understanding can be gained through facilitating awareness, communication, coordination and content in collaborative design and learning. In detail it suggests that the collaborative learning and design process starts with acquiring self-awareness, which is a very important skill to recognize one's own work style. Self-awareness leads also to an awareness of others, which enables working alongside another. Discussing results and strategies with this individual through meta-communication enables collaborators to gain a shared understanding about similarities and differences of work styles and aims. This enforces trust and helps to build a shared team culture, to establish team rules and roles, and to accomplish goals. Finally, this new, shared perspective is incorporated into the collaborative project. Although this model gives a good overview of aspects of intercultural collaborative learning processes it also shows many limitations and knowledge gaps especially in relation to user-centered, contextual learning, design and innovation. These need to be filled by further research. Therefore, despite of the shortcomings of the model and in order to define a framework for intercultural, contextual, learning and design innovation, it guided the analysis of the case studies, which will be introduced in the remainder of this paper.

Methodology

Approach

Since there has not been much research conducted in this particular field, exploring intercultural collaborative design and learning in international summer schools afforded a situated study to gain a first understanding of practices employed in such contexts. Methodologies for studying an entire activity system within a certain context were established in ethnographic research. The major research interest was the discovery of regularities within interaction design summer schools and discerning patterns in the interactions between the participants. The author chose to conduct a qualitative evaluation of interactions observed within this long-term naturalistic inquiry using a holistic ethnographic approach (Tesch 1990).

Data Collection

The author observed three international information and interaction design summer academies between 2003 and 2005 as case studies. Each summer school was held over a period of two weeks. Around 40 postgraduate students and young professionals aged between 22 and 35 came from a variety of design related professions like Fashion, Graphic or Product Design, but also Computation, Social Studies or Marketing. Participants were assigned to teams between 5-10 members. The distribution was focussed on bringing together a variety of professions, cultures and ages among the students, atelier leaders, invited lecturers and local experts. A typical team was composed of 6-7 international participants from Europe, Asia and the Americas and 2-3 local students, which were indispensable for the teams. The scheduling of each day reserved the morning-time for guest lectures, while the afternoon was left for the teams' individual projects. The overall setting of the summer school supported experimental, explorative and open-ended design projects and encouraged the discovery of needs and requirements of an unfamiliar target audience. The school prescribed neither a design goal nor a project framework. Instead the team facilitators introduced a broad design topic as well as models and methods to structure the design process on demand. Taking the role of a participant observer, the author examined team communication and coordination practices, made notes of communications, conducted informal interviews, collected documents and made pictures of the use of artifacts and activities. In order to triangulate the data gained from the observations, collaborative design pattern workshops * were carried out with some school participants at the end of two of the three observed summer schools.

Coding and Analysis of the Data

In the following step, the data were viewed, sorted, coded and analyzed using TAMSAnalyzer™ and GraphViz. Two types of codes were used to structure the observations - data codes and context codes. While data codes were applied to a single idea, context codes structured bigger chunks of observations. First, the data codes were categorized into *breakdowns*, *dealing with breakdowns* and *gaining common ground*. Those categories were furthermore divided into *awareness, communication, coordination* and *content*. Second, the context code and concept of cultural value differences framed the analysis of collaborative design and learning activities in this international setting. For this context code, the author used the 6 most frequent cultural value categories proposed by Marcus and Baumgartner (2004): [1]

Authority Conceptions, [2] Community Aspects, [3] Activity Orientations, [4] Context in Communication, and [5] Time. However, after the first review of the data a sixth group was added, which was [6] Uncertainty Avoidance.

Findings and Discussion

Previously a lack of knowledge regarding how intercultural collaborative design and learning support contextual innovation was identified. A major question this section seeks to answer is how intercultural collaborative learning and design can be supported in a specific locality leading to contextual design innovations for this local market. The focus is on how contextual, user-centered innovation (iteration of designs and user involvement) interplays with collaborative learning and design activities in international design summer schools. Hence, the author going to outline the findings in a way that shortly introduces the most significant tradeoffs and breakdowns in collaborative learning and design first, and subsequently explores strategies to deal with breakdowns and gain common ground thereafter. Following this section, a model for intercultural collaborative design and learning processes supporting contextual design innovation will be proposed.

Breakdowns

In this section I identify the most common challenges and misunderstandings, which sometimes lead to misinterpretation of behavior and breakdowns in the interaction among team members. The numbers in the brackets stand for the frequency of occurrence of this observation in the context discussed at this time.

Code Categories	**Breakdowns**		**Dealing with Breakdowns**		**Gaining Common Ground**	
	Total	**Percent**	**Total**	**Percent**	**Total**	**Percent**
Awareness	105	18	0	0	698	39
Communication	218	37	183	34	230	12
Content	63	11	24	4	426	24
Coordination	198	34	334	62	441	25
Total	**584**	**100**	**541**	**100**	**1797**	**100**

Table 1 A Frequencies of the breakdowns data code and sub categories

A total of 584 instances of breakdowns were identified in the data as displayed in Table 1. Figure 2 shows a graph of all data codes in the breakdowns category. While communication and coordination were with one third the most recurrent categories in which breakdowns were coded nearly one fifth were based on awareness issues. The most frequent cause for miscommunications was found to be the *lack of awareness of the other participant's expectations [37]*. The second most recurrent reason for breakdowns was observed to be *facilitation methods [35]* followed by differences in the team members understanding of the *function of authority [29*] in the coordination of activities. Often members simply *did not speak up [23]* in an open manner if they had difficulties to accept *the way another member was used to working [24]*. Rather they *hid their resentment [13]* and accumulated small problems until major breakdowns occurred. In many cases not daring to speak up could be related to a lack in *English language proficiency [23]* of some members and *culturally varying face-saving techniques [27]* of especially Asian team members. Varying expectations and communication strategies were an issue that influenced the ability to fully *understand design ideas [29]*.

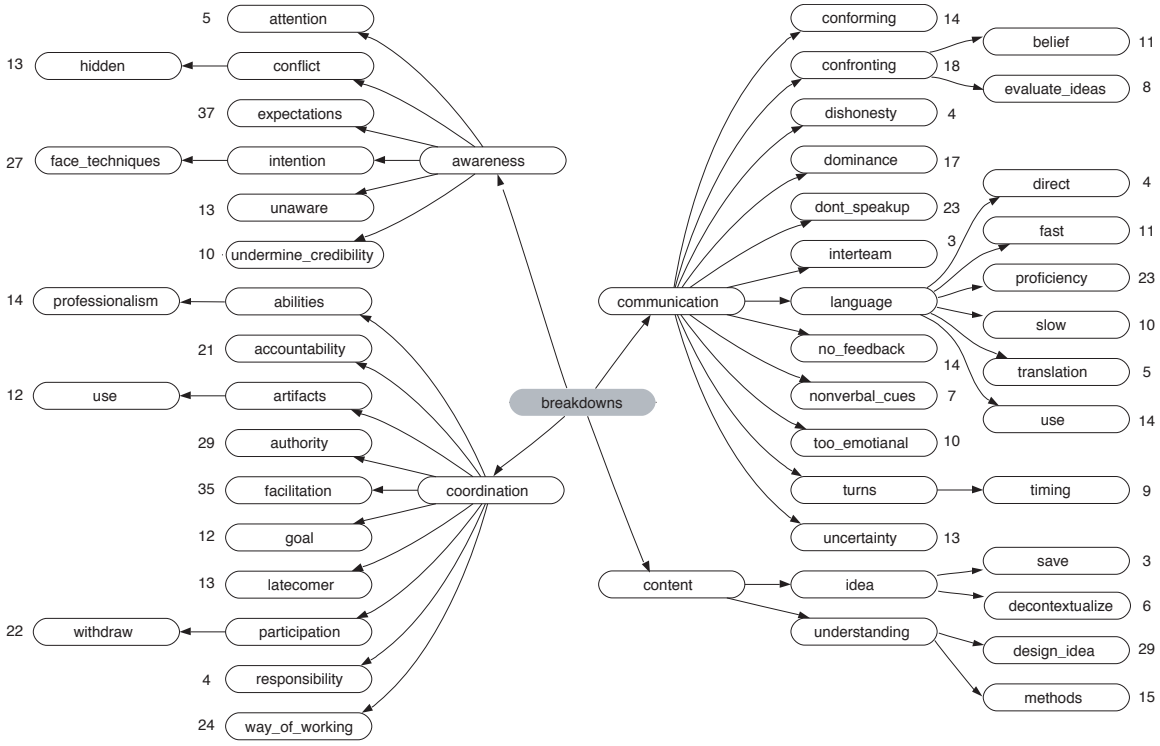

Figure 2 Observations and frequency of occurrences in data code category breakdowns

According to the data in Table 2, community or contextual communication values that differed among the cultures represented in the teams caused the majority of breakdowns. Team members' mutual *awareness of each other's expectations [37]* relates to the way a group is organized. Breakdowns occurred based on clashing expectations of individualist and collectivist values when setting up a community structure in collaboration.

Differences in Cultural values regarding	Breakdowns		Dealing with breakdowns		Gaining common ground		Total	
	Total	%	Total	%	Total	%	Total	%
Activity	41	7	55	10	188	10	285	10
Authority	96	16	89	16	140	8	325	11
Community	151	26	99	18	370	21	620	21
Context	160	27	157	29	697	39	1014	35
Time	38	7	50	9	85	5	173	6
Uncertainty	91	16	83	15	309	17	483	16
Total	**584**	**100**	**541**	**100**	**1795**	**100**	**2920**	**100**

Table 2 Breakdowns, dealing with breakdowns and gaining common ground correlated to the context code cultural values

The second most frequent reason for breakdowns in collaboration was the *use of differing face techniques [27]*. Face-saving techniques can hide or expose intentions, separate or integrate individuals, challenge or maintain the harmony in the team. Face-saving techniques are manifested in the use of *confronting [14] or conforming [18]* communication strategies. In addition, context values in communication can further explain misunderstandings in communication caused by the differing communication styles. Some member prefer to say directly what they think and intend to do, whereas others prefer to take action and expect the others to interpret those actions rather than words. A member, who uses *face-saving techniques and hides intentions [13],* makes it difficult for members with a more direct and hence low contextual communication style to read the contextual signs of the other team member. This leads to misunderstandings, which often

end in a weak work morale i.e. *latecomer [13]* or the *withdrawal from participation [13]* of the member with a high contextual communication style in order to keep harmony in the community. Hence, differing contextual communication strategies influence the group dynamic and social relations in the team, which has an effect on the *accountability [21]* of team members and the *acceptance of design ideas [29]* put forward by those members respectively. Some members *conform [14] to dominant members [17], others confront [18] in communication* especially when the team *evaluates design concepts [29].*

Another breakdown in communication in relation to understanding design concepts and the way work is coordinated is based on *differing use of language [14]* of team members. Language use is not just limited to the *proficiency of English language [23].* A much more subtle communication problem leading to misunderstandings and breakdowns arises from how *fast [11]* or *slow [10]* members develop and communicate ideas. Some members need time to formulate the perfect idea and communicate it only if it exactly expresses the intended meaning (slow), however, other members communicate their ideas at the time they popup in their head, not considering how elaborated the idea is presented to the team (fast). Especially *dominant team members [17]* who push design ideas in their intended direction do not realize that this causes slower members to *withdraw [13].* Dominant members easily have little patience for the *facilitator's use of authority [29]* to reintroduce those members in the team, which causes breakdowns in teamwork.

This was a very brief discussion of reasons for misunderstandings in cross-cultural collaborative design and learning. Knowing about the possible reasons for breakdowns is important. However, more important is to know about specific awareness, communication, coordination and content supporting collaboration strategies to gain common understanding and deal with breakdowns in this particular international design education setting. Therefore, I will describe in the following section how specific collaborative design and learning techniques and cross-cultural team compositions prevented breakdowns, approached misunderstandings and turned them into valuable knowledge for the summer school participants.

Gaining Common Ground and Dealing with Breakdowns

As mentioned beforehand intercultural communication literature suggests two strategies - gaining common ground and dealing with breakdowns and four specific techniques – awareness, communication, content and coordination to overcome misunderstandings and support collaboration processes leading to implementations and innovations based on the teamwork.

A total of 1797 data codes in the category "gaining common ground" were counted as displayed in Table 1. The data in Table 2 shows, while the majority (two-fifths) of the observed techniques to gain common ground were coded in the awareness category, one-fourth of all observations used either coordination or content techniques. Moreover, Table 1 shows that among 541data codes in the category "dealing with breakdowns" nearly two-fifth of the techniques to deal with misunderstandings were communication strategies. However, the most frequent strategies (over three-fifths) were observed in the coordination category. This result supports the idea that the most successful way to learn and design collaboratively is based on gaining common ground through awareness and content and dealing with breakdowns through coordination and communication. These findings will now be explained in greater detail and analyzed in the context of cultural values in the following sections.

Awareness

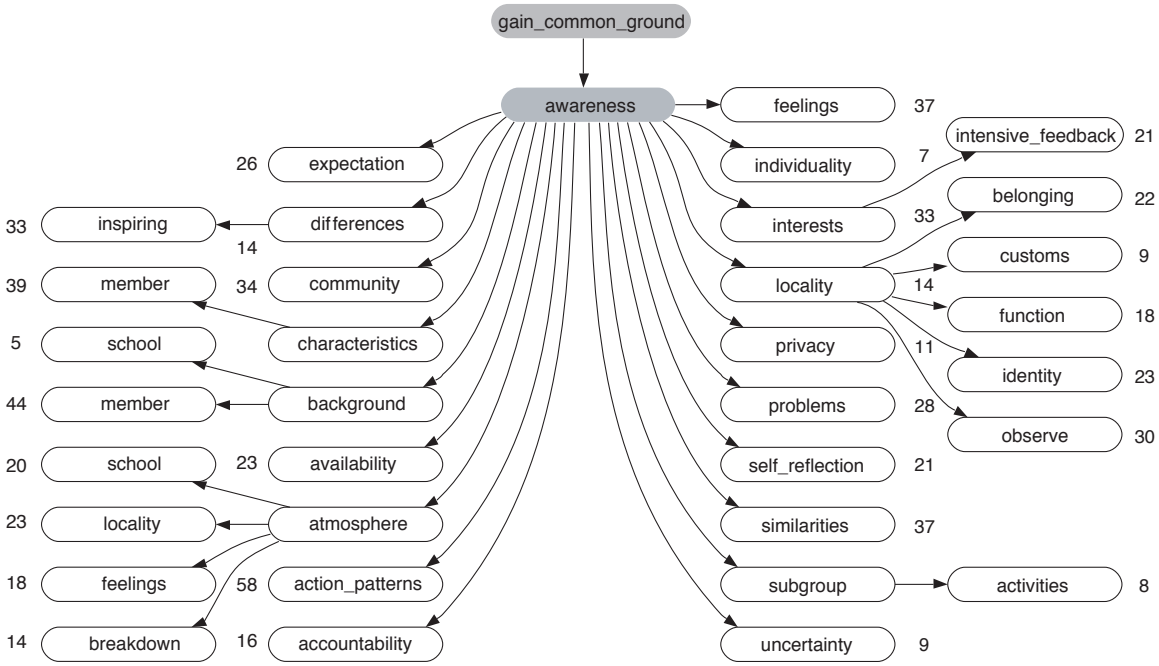

Figure 3 Observations and frequency of occurrences in data code category awareness

The data code frequencies displayed in Figure 3 show that members most frequently gained common ground through the awareness of *action patterns [58]*. The co-coding frequency of this code with other data codes displayed in Table 3 suggests that awareness of action patterns was gained predominantly through the *awareness of the characteristics of the team members [39],* especially the *awareness of similarities [37]*. Awareness of similarities among members was achieved though *intensive feedback [21]* on shared topics of interest. Additionally, an awareness of the *members' differences also inspired [33]* the participants' interactions.

Cultural values	**Awareness**		**Communication**		**Content**		**Coordination**		**Total**	
	T	**%**	**T**	**%**	**T**	**%**	**T**	**%**	**T**	**%**
Activity	64	9	18	4	55	13	103	13	240	10
Authority	34	5	47	11	27	7	120	16	228	10
Community	164	23	73	18	54	13	169	22	460	20
Context	285	41	206	50	188	44	171	22	850	37
Time	27	3	27	7	17	4	64	8	135	6
Uncertainty	121	13	41	10	90	21	139	18	391	17
Total	**695**	**100**	**412**	**100**	**431**	**100**	**766**	**100**	**2304**	**100**

Table 3

The data show that the gaining common ground through making *observations in the locality [30*] not only helped to develop potential design ideas but also to get to know about different perspectives of fellow observers and teammates. The main focus of these observations was gaining *awareness of the functionalities in the locality [18]* and reaching a minimal understanding of the *local identity [23]*. Gaining an understanding for the locality and interacting with the local population generated a *feeling of belonging to this community [22]*.

Cultural values	**Awareness**	**Communication**	**Content**	**Coordination**	**Total**

	T	%	T	%	T	%	T	%	T	%
Activity	64	9	18	4	55	13	103	13	240	10
Authority	34	5	47	11	27	7	120	16	228	10
Community	164	23	73	18	54	13	169	22	460	20
Context	285	41	206	50	188	44	171	22	850	37
Time	27	3	27	7	17	4	64	8	135	6
Uncertainty	121	13	41	10	90	21	139	18	391	17
Total	**695**	**100**	**412**	**100**	**431**	**100**	**766**	**100**	**2304**	**100**

Table 4 Comparison of cultural values and collaboration support categories in the code categories dealing with breakdowns and gaining common ground

Table 4 shows that a mix of *communal [23%]* and *contextual communication [41%] cultural value orientations* played a dominant role in gaining awareness in collaboration. Within collaborative design and learning activities, a collective value orientation stimulated members to get to know as much as possible about the fellow member, which enhances specific relationships [*buddies 17*] and expressive interaction styles [*intensive feedback 21]*. Engaging in communal activities i.e. museum visits, leisure and evening activities, or home stay opportunities reduced uncertainty in social relations that balanced a high uncertainty within the teamwork in the beginning of the course. The awareness of others and the context of learning and design seemed to support collaborative learning and design in international design summer schools.

Communication

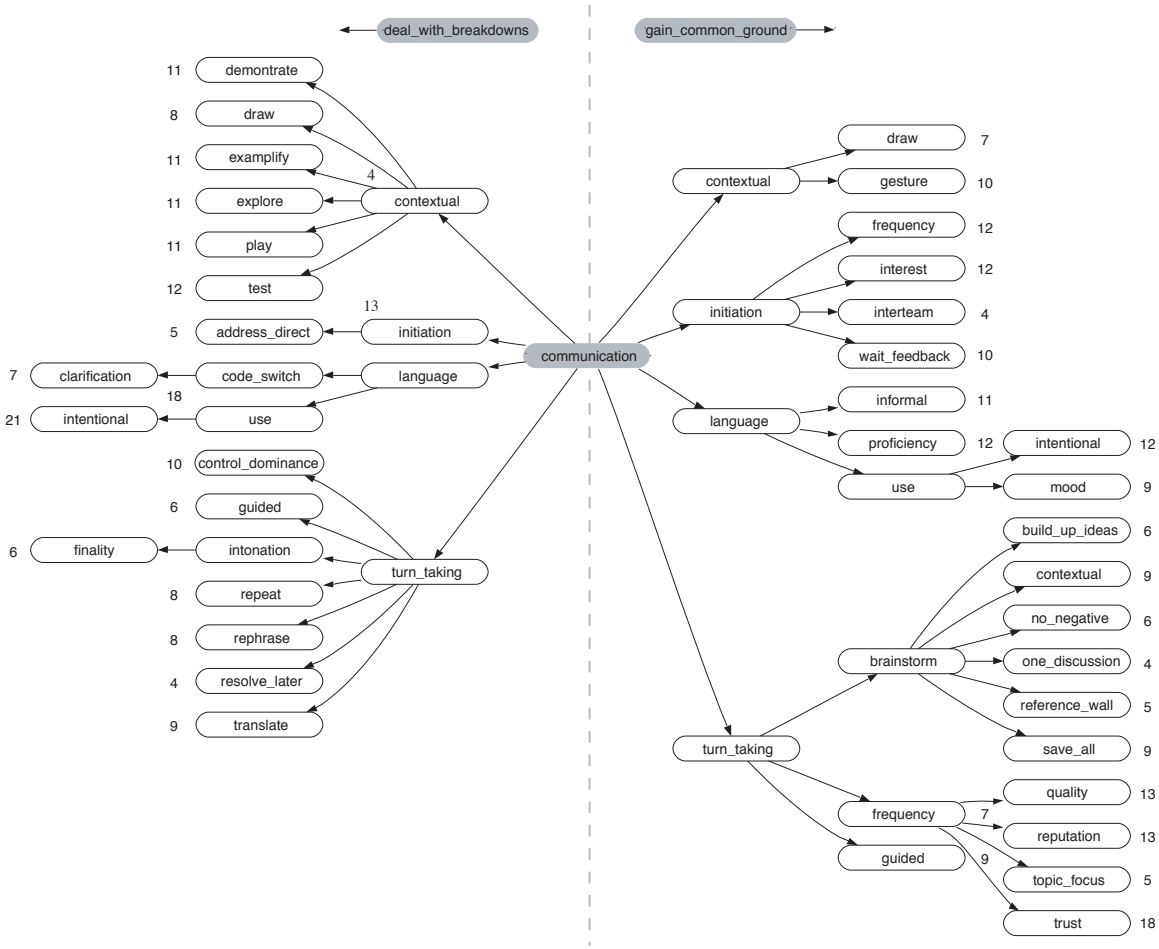

Figure 4 Observations and frequency of occurrences in data code category communication

This section introduces several distinct intercultural communication strategies to deal with breakdowns and gain common ground as Figure 4 illustrates. The findings from the previous section suggest that awareness of different cultural backgrounds and the members' characteristics made them aware of the *level of English language proficiency [12]* of the co-participants. This understanding stimulated participants to employ *intentional communication techniques to deal with breakdowns [21] or gain common ground [12]*. An initial awareness was gained through *informal communications [11]* prior to work-related discussions. Participants frequently *initiated communication [13]* based on a *shared interest in a topic [19]* among the team members and with the local population to learn about the subject and each other. The more similar the interests the more likely a *high communication frequency [18]* was maintained. A high turn taking frequency led to grow reliance in the *member's permanent engagement [18]*. However, this practice sometimes created a *communication dominance* that needed to be *controlled [10]*. English native speakers usually inherited this dominance in conversation since they were more comfortable expressing their thoughts and ideas in English. In order to deal with such an apparent breakdown, native speakers were asked to let non-native speakers take the first turn in a discussion. Such an *active mediation [18]* as well as *switching between local and English language [18]* facilitated communication within the team or with the local population. If dominance could be controlled and code switching was employed, brainstorm activities helped overcoming breakdowns by *involving all members in the discussion [22]*.

In addition, various *contextual communication practices [9]* like *demonstrating [11], exemplifying [11] or testing [12]* design ideas using *explorative [11]* and *playful communication [11]* can inspire a creative use of design ideas and artifacts. This fostered innovative design solutions, which only arose because team members were forced to go beyond verbal communication in this intercultural setting. In this context, *storytelling [32]* was found to be an often-used technique to contextualize and communicate design ideas to gain common ground. Stories often combine *observations made in a locality [30]* with the *background knowledge [44] and interests of a member [33]*. They evolve around *observations of the functions of the surrounding locality [18] or the specific use of an artifact [35]* while *experiencing various user-centered design methods [47]*. Stories and design ideas can more efficiently be mediated in international settings using *gesturing [10] or drawings* [7].

Differences in Cultural Values regarding Communication using:	**Activity**	**Authority**	**Community**	**Context**	**Time**	**Uncertainty**	**Total**
Dealing with Breakdowns:							
Code Switch	0	2	2	13	1	0	18
Intentional Language Use	2	4	2	9	3	1	21
Initiation	0	0	5	6	2	0	13
Contextual Testing	1	0	2	4	0	4	12
Contextual Playful	0	0	1	9	0	1	11
Contextual Explorative	0	0	2	5	0	4	11
Contextual Exemplify	0	0	0	8	1	2	11
Contextual Demonstrate	0	1	1	8	0	1	11
Gaining Common Ground:							
Turn taking frequency trust	1	1	8	5	1	2	18
Turn taking frequency quality	1	1	7	4	0	0	13
Turn taking frequency reputation	0	2	5	5	0	1	13
Intentional Language Use	1	1	2	6	1	1	12
Language Proficiency	0	1	2	6	1	2	12
Initiation Frequency	1	1	1	7	1	1	12
Initiation by Interest	0	1	4	7	0	0	12
…							
Total	**18**	**47**	**73**	**206**	**27**	**41**	**413**

Table 5 Cultural values in dealing with breakdowns and gaining common ground in communication code category

This finding is supported looking at the results in Table 5 and 6. High contextual communication is the most prevailing culturally influenced strategy to gain common ground and deal with breakdowns through communication in collaborative design and learning. A high contextual communication style enables to communicate using fewer words by sharing the same context. Furthermore, contextual communication styles intersect with community values. Especially awareness of action patterns leads to the repeated use of high contextual communication strategies to gain common ground. In design activities, this awareness turns into social information that can be used to communicate in multiple modes.

Content

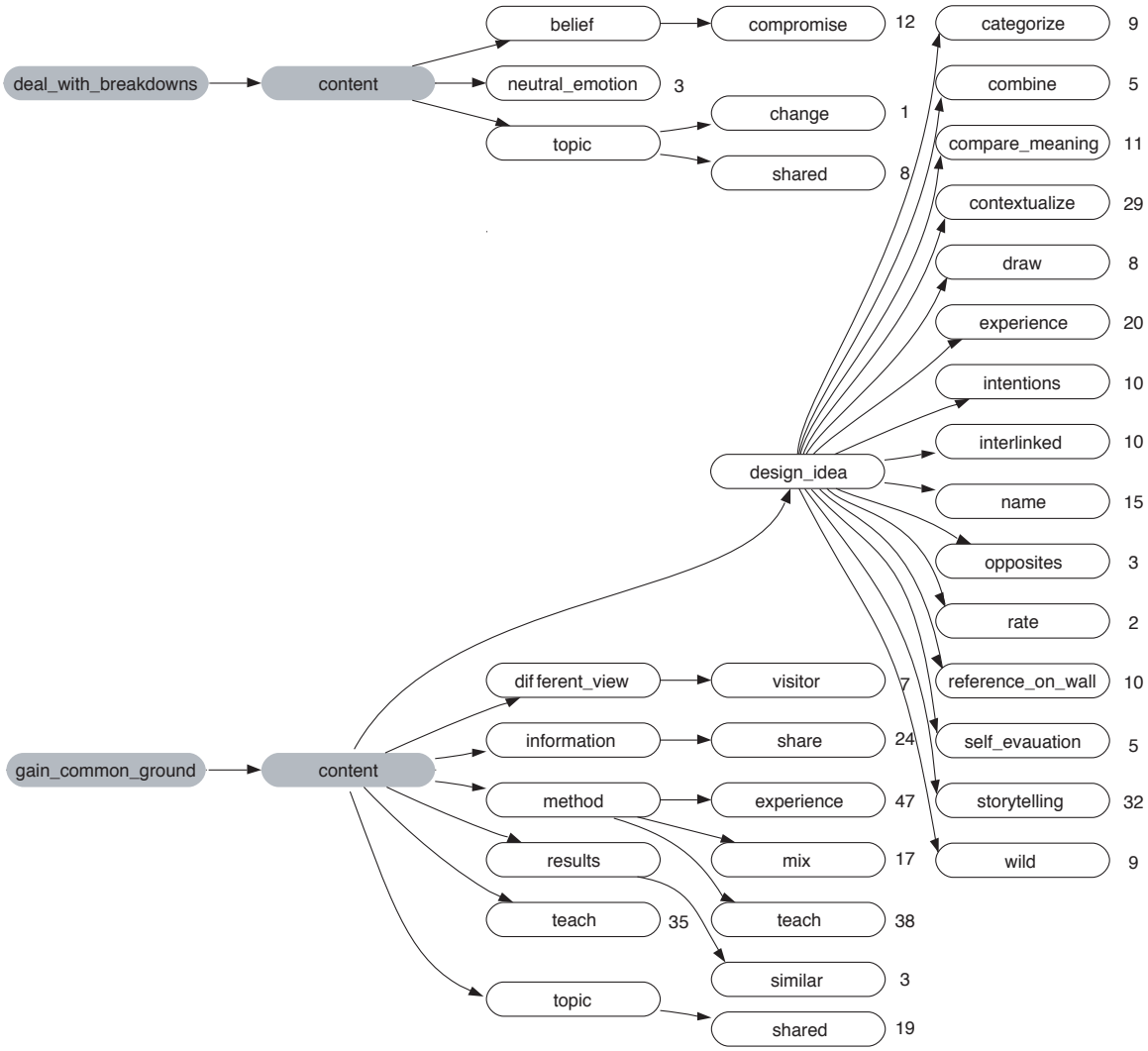

Figure 5 Observations and frequency of occurrences in data code category contents

Figure 5 shows that the most outstanding solution to gain understanding about the content in the collaborative design project occurred while *experiencing user-centered methods [47]*. Participants were enabled to experience methods by *teaching a variety of promising methods in lectures [38]*. Daily *lectures [35]* that not only listed possible methods but also exemplified successful projects using these methods contributed to establish norms and give direction for possible contents in collaborative design activities. Furthermore, the data in Table 6 suggest that lectures reduced uncertainty about the processes and

expectations of the participants. Lectures and hands-on experiences offered a rich and lively picture of the market and users the participants will design for. They established a *shared topic [19]* for all teams. Based on the shared topic, participants from different *teams shared information [24]* about the findings and insights gained by making inquiries in the local context. The teams were encouraged to *mix various methods [17]* in order to learn through tangible experiences and in order to triangulate data. Probes or prototypes supported the exploration and *experience of design ideas [20] and methods [47]* and generated innovative *design ideas [36]* for the local market. Collecting contents through design probes, prototypes [*creative artifact use 35*], or scenarios [*storytelling 32*] were aids to experience the applicability of design ideas. *Sharing the information [24]* that were found through these experiments with other teams helps gaining an awareness of a *design community [34]*. The findings also suggest that the difference between their recent experiences in the local context and the members' previous expectations was very *inspiring [33]* and encouraging.

Gain Common Ground: content: experience method	**Co-coding frequency**	**Total**
Gain Common Ground: content: teach method	19	38
Gain Common Ground: content: mix method	14	17
Gain Common Ground: coordination: facilitation interest directs	8	28
Gain Common Ground: coordination: facilitation give a task	7	21
Gain Common Ground: awareness: community	7	34
Gain Common Ground: content: teach	6	35
Gain Common Ground: awareness: differences inspiring	6	33
Gain Common Ground: awareness: interests	6	33
Gain Common Ground: content: design idea: contextualize	6	29
Gain Common Ground: content: information: share	6	24
Gain Common Ground: coordination: artifact use	6	35
Deal with breakdowns: contextual communication: test	5	12
Deal with breakdowns: coordination: define process	5	18
Deal with breakdowns: coordination: self-organization	5	29
Gain Common Ground: awareness: members' background	5	44
Gain Common Ground: content: shared topic	5	19
Deal with breakdowns: coordination: subgroups	4	20
Gain Common Ground: awareness: action patterns	4	58
Gain Common Ground: awareness: expectation	4	26
Gain Common Ground: awareness: locality: identity	4	23
Deal with breakdowns: contextual communication: explore	4	11
Deal with breakdowns: contextual communication: demonstrate	4	11
Gain Common Ground: coordination: activities	4	30
Gain Common Ground: coordination: facilitation have a vision	4	20
Gain Common Ground: coordination: goal	4	18

Table 6 Selection of correlations of experiencing user centered design methods with other codes

For the purpose of testing designs in the local environment, participating local team members a key role as *local experts [10],* to *coordinate activities [30]* and act as *translators [9]* in interviews and tests. Therefore, code *switching [18]* for *mediation and clarification [7]* purposes among locals and between local and non-local participants helped gaining specific knowledge about *customs [9], artifact usage [35],* and other *functions of the locality [18]*. In conclusion, a mix between conveying new knowledge through formal teaching and experiencing new methods in a real context provided the best mix of contents for a collaborative design project that led to a successful learning experience.

Coordination

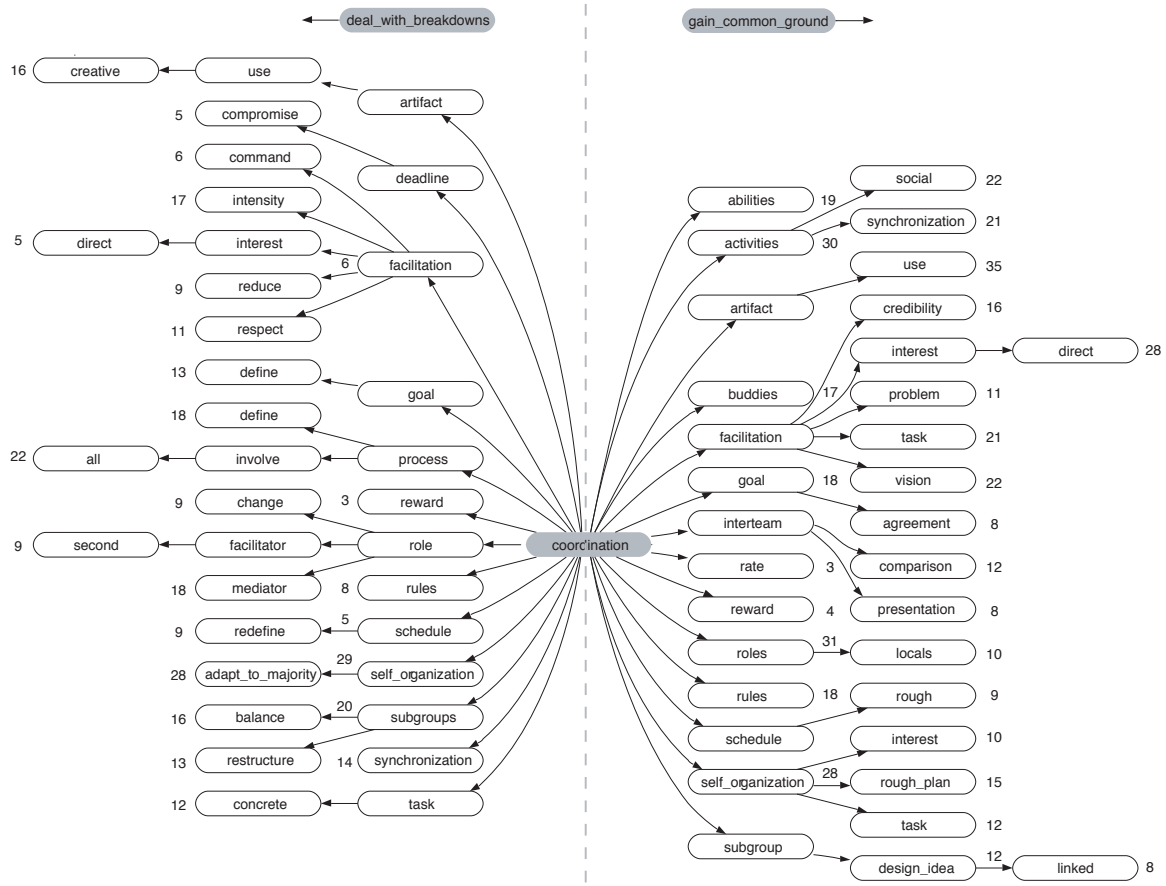

Figure 6 Observations and frequency of occurrences in data code category coordination

The coordination of the *teams' activities [30]* needs to strike a balance between *facilitation [17] and self-organization [29]* of the team. Looking at the results displayed in Figure 6, *self-organization* was observed to be one of the most successful coordination strategies to gain *common ground [28]* and to *deal with breakdowns [29]* likewise. In the beginning of the teams' self-organization, basic teamwork *rules [18]* and the awareness of a *shared process [18]* were all established, inspired by the *lectures [35]* and by the *facilitator's interests [28]*. Often the process was laid out on the basis of a common interaction design process model (Preece 2002, Westerlund 2004).

Looking at the co-coding frequencies displayed in Table 8 suggests that while advancing in the process, experiencing and testing possible design methods and ideas the team gains confidence and the *facilitation intensity should ideally decrease [17]*. Due to *interest [10] or ability [19]* members take up *roles [31]* in the team. Some members' roles are strong and can lead to conflicting situations. Hence, in order to test and explore as many design ideas as possible but separate potential dominant members, a team splits into *subgroups [20]*. Subgroups cluster around strong members or members with *similar interests [33]*. The less experienced or less language proficient *members adjust to the majority [28]*. This accommodation strategy is based on culturally varying community and communication techniques, which help to *balance subgroups [16]* and to *compromise if a deadline approaches [5]*. Another strategy to involve all members in teamwork is the coupling of only two members as *buddies [17]* rather than the formation of large subgroups, which gives those members, who have difficulties speaking up in front of a big group a chance to get their ideas considered, too. A third method involves finding *concrete tasks for members [12],* who have difficulties to speak up in order to give them a chance to *change their role [9]*. With the satisfactory completion of an explicit task, these members can show their *accountability [16]* and gain attention, *trust [18]* and *acceptance of their ideas [11]* within group discussions. Nevertheless, a problem with the grouping around strong members and accommodation of other members is the lack of consideration of

potentially valuable ideas from members with face hiding communication techniques and strong hierarchical authority perception, who often *don't dare to speak up [23]* to the main facilitator of the team, because she is perceived as higher-ranking. To address this cultural difference, more specific relations and instrumental interaction styles can be employed. A second facilitator, who is perceived on the same hierarchical level, can have the task to look for problems and suggest ways to solve problems among team members.

Gain Common Ground: coordination: self-organization	**Co-coding frequency**	**Total**
Gain common ground: coordination: roles	7	31
Gain common ground: coordination: self organization: interest	7	10
Gain common ground: coordination: self organization: rough plan	6	15
Gain common ground: awareness: action patterns	5	58
Gain common ground: content: method: experience	5	47
Deal with Breakdowns: coordination: self-organization		
Deal with breakdowns: coordination: synchronization	9	14
Deal with breakdowns: coordination: role: mediator	6	18
Deal with breakdowns: coordination: subgroups	6	20
Deal with breakdowns: coordination: subgroups: balance	6	16
Deal with breakdowns: coordination: role: change	5	9
Deal with breakdowns: coordination: rules	5	8
…		

Table 7. Selection of self-organization data code co-coding frequencies

The significance of self-organization within the team is affirmed looking at the cultural value of contextual communication and uncertainty avoidance. To overcome breakdowns in situations of high uncertainty, collaborative design activities benefit from self-organization within the team. In self-organizing teams members are more self conscious about how to use their abilities and find their roles and responsibilities. A low contextual communicating member might be able to summarize ideas or control dominance in a brainstorm session. Such a member might define more concrete goals after high contextual communicating members explored various ideas using experimental, playful and hands on design exercises. A possible breakdown based on the feeling of not being needed or not being understood is hence avoided.

Implementations – Contextual Design Innovations and Learning

The preceding sections demonstrated that learning occurs through frequent design implementations throughout the entire collaboration process. This section will give two examples of collaborative design and learning processes that utilized above outlined practices to consent on innovative designs for a local market. The design proposals of the teams were presented in form of low to high fidelity prototypes and scenarios, which were captured in drawn, animated, or acted out moving or still photo images.

A teams from the summer school, which was held in Split, Croatia 2004 introduced several design proposals that support sustainable tourism and foster interaction between different groups of people in the town. This particular case focused on communication between locals and their guests, the tourists. By collecting public artifacts, conducting interviews with the residents, observing them within their local environment, and continuously reconciling design constraints, the team was able to generate several concept alternatives to address the city's socio-economic needs. (Figure 7)

Figure 7. Methods to determine communication strategies between locals and tourists in Split

The perceived open-mindedness and hospitality of local people in Split, Croatia was used to explore a scenario of sustainable tourism through an exchange of local and personal experiences with interested tourists (Figure 8). An "online-dating" service was proposed as a way to match locals and tourists who shared common interests. Travelers often inform themselves about the history, activities and sights they might visit during their stay. Local people enjoy meeting tourists for cultural and language exchange. A communication and knowledge area online matching service would help both sides to benefit from mutual interests. Moreover, a system for identifying and sharing "key-spots" in the city was proposed as a means to introduce tourists to "hard-to-find" local places. And, finally a concept was developed to let locals and tourists collaboratively create a continuing story thorough interacting with e-boards placed throughout the city. The aforementioned design suggestions were then united into a single video-photo story to convey the workability and interconnectedness of the communication concepts in scenarios.

Figure 8. Scenario to demonstrate communication strategies between locals and tourists in Split

A teams from the summer school that was held in Timisoara, Romania 2005 dealt with the issue how storytelling can be used to sustain informal communication about the past, present and future of the city of Timisoara among its townspeople. The participants came up with an invention of an experimental and novel recipe communication device called the Umami-E-Card and a supporting service, the Umami-E-Market. The design team used multiple user-centered methods to determine the requirements for communicating recipes from the past into the future. In iterative phases of low, medium and high fidelity prototypes a paper foldable card, called Umami-Card, was prototyped and tested. (Figures 9 and 10)

Figure 9. Methods used to determine the relation of food mediation in Romania

This card captured different dimensions of recipe-mediation and carried the user through the entire cooking process. When testing the Umami-Card prototype, it quickly became apparent that users were connecting personally with this object. Many expressed interest in annotating the content of the historical context, recipes and explanatory text with their own stories and experiences. No one could imagine giving the device away as a gift, let alone returning it at the end of the evaluation cycle. However, many users talked about exchanging content with other users or updating the device to include new recipe variations.

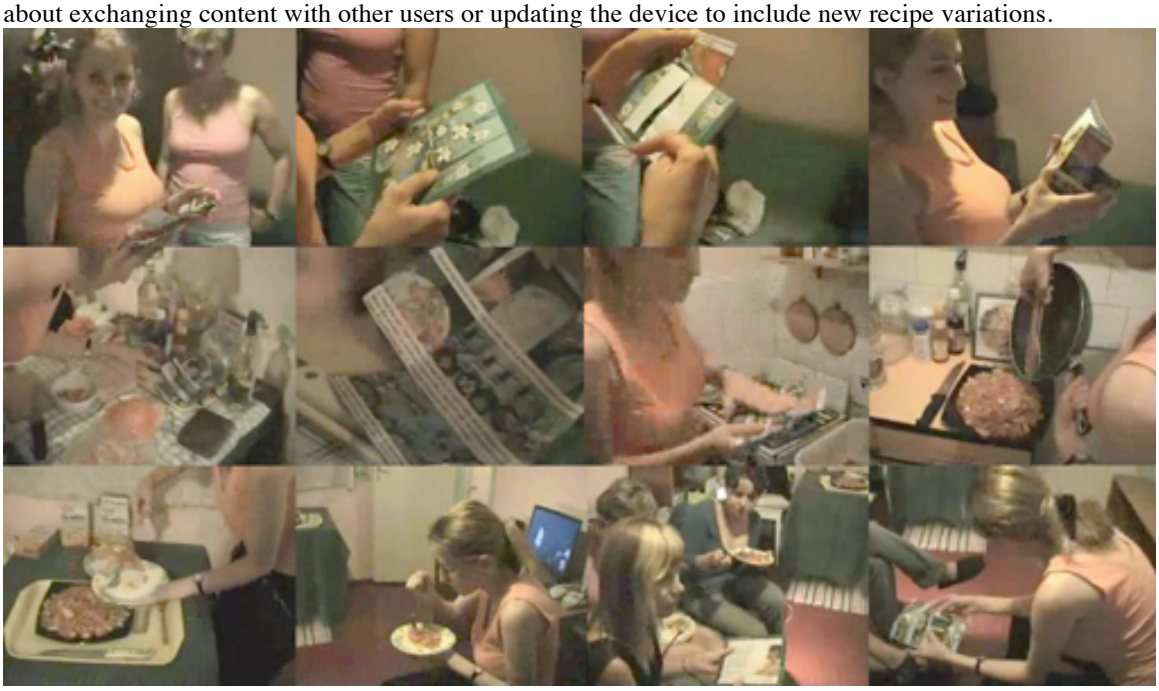

Figure 10. User testing used to determine the acceptance of an alternative food mediation device in Romania

To support this changeability, the idea of a tangible interface that is connected to a Umami-E-Market, an Internet peer-to-peer sharing platform evolved. A photo-scenario described the idea of a recipe database that collects the recipes from all over the world (Figure 11). In this use case people utilize a tangible interface, the Umami-E-Card, to up- and download data to and from the Umami-E-Market. This presents a way of saving the user's own experiences, allowing communication and sharing of stories with other users thus prolonging the user's personal enjoyment of this object.

Figure 11. Scenario for the presentation of an innovative food mediation device and service in Romania

The above-described examples show that "quick and dirty" implementations and frequent tests of the designs were used to advance knowledge at various stages of the design project. Teams continuously learned and evaluated the designs in order to determine the acceptance of novel design ideas and interaction strategies in these specific local environments.

A model for cross-cultural collaborative learning and design fostering contextual innovation

The main findings of this study clearly show distinct intercultural collaborative design and learning strategies that allow teams to gain common ground and deal with breakdowns. The model shown in Figure 12 synthesizes all above-discussed issues and proposes a framework to support cross-cultural collaborative learning and design that fosters contextual innovation. The framework proposes that knowledge about the local context, and characteristics and backgrounds of other team members make aware of action patterns within the design community. This initiates a conversation with fellow teammates and the local population, increases consciousness about the use of language and stimulates high contextual communication practices in collaborative design and learning. Storytelling is an important communication strategy that supports agreement on design ideas in collaboration. These contents are experienced through hands-on design experiences in the local setting and supported by lectures given by experts in the field. The team activities are coordinated mainly through self-organization, which is fostered through a growing body of knowledge and confidence by testing design ideas in a concrete local setting. This allows decreased facilitation intensity and improves contextual learning and design innovation process. Various implementations in the format of probes, prototypes or scenarios at different stages of the design workshop secure more awareness, inspire conversations and open up to new content as well as help self-organizing and coordinating the team's activities. This is shown in Figure 12.

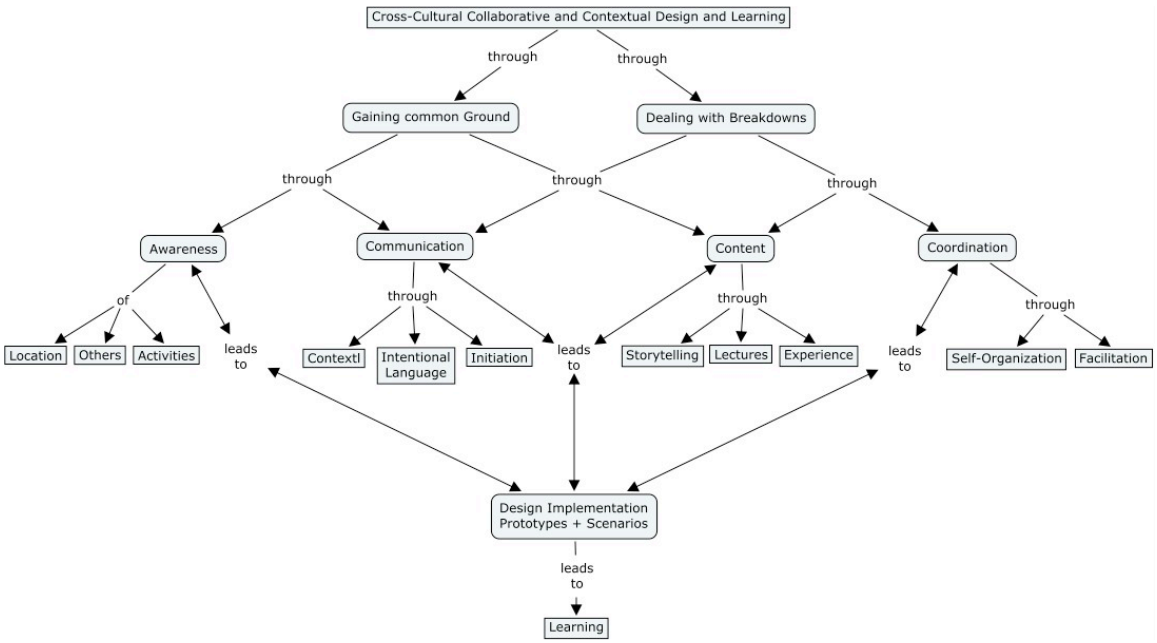

Figure 12. A model of cross-cultural collaborative design and learning for contextual design innovation

Conclusions

This article argued that cross-cultural collaborative learning and design fosters contextual innovation in early design phases, as found in interaction design summer schools. The results of the observations of three cases of interaction design summer schools were discussed in the light cross-cultural collaboration theories. The findings of this study confirmed that misunderstandings and breakdowns in cross-cultural collaboration can be prevented or addressed by raising intercultural awareness, by engaging in contextual and multi-modal communication and by experiencing the content of collaboration in hands-on activities and through frequent and quick implementations of designs in a local environment. These experiences enhance confidence and encourage self-organization of the team while facilitation intensity decreases.

The results of this study also confirm the positive role of user-centered design in design innovation. Moreover, user centered design in and for a local market benefits from a culturally and professionally diverse team composition. While a foreign design context inspires international summer school participants, local participants are motivated to go beyond the known design solutions from this alternative design perspective. This might lead to the interpretation that intercultural teams designing in and for a local market can trigger design innovations for this market. Furthermore, participants learn contextually about themselves, their culture and others, and discover how to engage in intercultural communication and collaboration, which can lead to design innovations.

This article presented an explanation of cross-cultural collaborative design and learning processes. It reported about interaction design summer schools that offer a platform for contextual innovation in early design phases. The findings and model introduced here may also guide summer school organizers, team facilitators and participants through a successful collaboration process and inspire contextual design innovation. Furthermore, the author believes that the findings have broader implications and might be considered in other educational or business related contexts where teams collaborate in search for design innovations.

Notes

* Design Patterns Workshops introduce a certain structure to a team discussion. The expert participants are asked to think about good solutions to problems they encountered in their design and learning processes in

a particular setting (here activities in the summer school). The results of the discussions are summarized and compared. Recurrent solutions are considered as “interaction design patterns”.

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